

On adopting a convention governing signs, couple-moment can be represented, for a normal axis, by an algebraic sum of areas. The application here also of the projection-process is an immediate consequence, and it is seen that the values of couple-moment for all parallel axes are equal. The final step in making the transition to the axis-vector is the convention according to which areas are represented by lengths properly laid off on their normals. The process of reasoning for moment of momentum is entirely parallel to that outlined for moment of force. And it can be shown (cf. Heaviside, "Electromagnetic Theory," i. p. 181) to cover the cases of angular velocity and acceleration. For the representation of an area by a length of its normal is the basis of the idea in the vector product of two vectors. The argument of the present instance forms a good elementary introduction to that conception.

F. SLATE.

University of California, April 24.

The New Comet.

ALTHOUGH others besides myself have probably noticed the remarkable inconsistencies in the published reports of the new comet, it seems worth while to draw attention to them. Its reported position for April 25, May 2 and May 4 are based on telegrams from the Cape and Peru, and there seems no reason to doubt their correctness. If, however, they are accurate, the comet could not have been seen in England in the morning, as at no time did it rise till after the sun. Yet Mr. Chambers saw it at Eastbourne at 3.5 a.m. on the 2nd, and a correspondent in the *Daily News* says it was fifteen degrees above the southern horizon at 3.30 a.m. on the 7th.

E. C. WILLIS.

Southwell Lodge, Ipswich Road, Norwich, May 13.

Blood-Rain.

IN view of the recent letters in NATURE regarding the fall of red rain in Italy, the following extract from Roger of Wendover's *Chronicles* of the year 1223 may possibly be of interest:—"In the same year it rained blood-coloured earth at Rome for three days, to the great wonder of numbers of people (vol. ii. p. 444 of Bohn's edition of Wendover's "Flowers of History.") It is rather curious that so miserably superstitious a *gobemouche* as Wendover should have described the phenomenon so accurately instead of calling it a rain of blood.

Polperro, Cornwall.

F. H. PERRY-COSTE.

THE ANTI-VIVISECTION SOCIETY AND LORD LISTER.

THE Anti-Vivisection Society held its annual meeting last week in St. James's Hall. We know these annual meetings; they are accompanied by an annual crop of distortions of scientific work and an annual volley of scurrilous charges against scientific workers and philanthropic administrators. Beforehand, all the perseverance of the accomplished party "whip" is drawn upon to get these meetings together, and afterwards all the ingenuity of the unscrupulous pamphleteer to boom in the Press what has taken place at them. The usual copies of certain daily papers marked in blue pencil under the name of Mr. Stephen Coleridge are sent out broadcast, reporting in detail the sentiments of the audience and the horrors of so-called vivisectors. Were this all it might well be passed over in contemptuous silence, but this year it pleased the meeting to impugn the philanthropic impartiality of one whom all the scientific, and indeed cultured, world delights to honour.

Mr. Coleridge gravely informed his audience, after having discoursed inaccurately on Lord Lister's scientific work, that this man of science was the intimate friend of fifty-eight licensed vivisectors, presumably because he had signed a certificate exempting them from the use of anaesthetics in their scientific experiments. These certificates were signed by Lord Lister in his capacity as president of the Royal Society, and the probability is that personally he was not acquainted with half-a-dozen of the licensees. Mr. Coleridge carefully avoided telling his audience that the vast majority of these "horrid vivisections," in which the use of anaesthetics was dispensed with, were simply inoculations, or, in other

words, mere pin-pricks; also that by the Prevention of Cruelty to Animals Act only very few persons of high scientific standing and training can sign these certificates, and that the president of the Royal Society is one,

Mr. Coleridge next turned his attention to scurrilous charges against Lord Lister, in particular, as chairman, and the committee, in general, of the Prince of Wales's Hospital Fund. He impugned the integrity of these gentlemen in that he stated they had given larger grants per bed to those hospitals which either had licensed laboratories attached to their medical schools, or had upon their staffs physicians and surgeons who were actually vivisecting, or had at some past time done so, than to those hospitals which had no connection either direct or remote with vivisectors. Further, that the Hospital Fund Committee had done this with the express object of encouraging so-called vivisection. Mr. Coleridge deduced the necessary corollary from this assertion, and stated point-blank that the Prince of Wales's Hospital Fund had simply been used to endow vivisection on a huge scale.

If we examine the facts we shall find that any hospital in London of any eminence whatever and performing philanthropic work of any magnitude, has upon its staff physicians and surgeons who have at one time or another experimented on animals. The small hospitals received small grants because their need was relatively small, and the large hospitals large grants because their need was relatively large, not because the former were unconnected and the latter connected with so-called vivisectors. Mr. Coleridge did not include in his speech the fact that he himself had endeavoured to strike a bargain with a London hospital, promising this institution the pecuniary support of the Anti-Vivisection Society if it would exclude from its staff all those whose medical knowledge had been derived from experiments upon living animals. The reply of this institution is worthy of record: it refused to allow any other considerations than those of medical or surgical efficiency to guide it in the choice of its officers.

This point has just now a very special interest, in that we believe that vivisection is to be made a party cry in the case of contributions to the Hospital Sunday Fund. Contributors are to be asked by the Anti-Vivisection Society when giving their contributions to demand that they shall only be devoted to hospitals having no connection with vivisectors or vivisection. So valuable have the results of experiments upon animals been to medical science that scarcely a hospital can be found independent of medical men who have derived their knowledge from them; and the Anti-Vivisection Society, with all its ingenuity and perseverance, cannot find amongst the ranks of its supporters a single medical man or indeed biologist of eminence. It is earnestly to be hoped that this fact will have its full weight with all contributors to hospitals, and that they will give their donations as they have done before, resting assured that their money will be duly apportioned by competent philanthropists accustomed to weighing justly the relative claims of charitable institutions, and not easily influenced by the clamourings, however loud, of ignorant partisans.

THE ARMY EDUCATION COMMITTEE.

WE are glad to learn that Sir Michael Foster has been added to the committee appointed to consider the present methods of selecting and training officers for the various branches of the Army. As stated in our number of May 2 (p. 23), this committee, as originally constituted, consisted of Colonel Jelf, Lieut.-Colonel Hammersley and Captain Lee, together with the Head Master of Eton, the High Master of St. Paul's, and the Right Hon. A. Akers-Douglas (chairman) and Captain Cairnes (secretary). Such a change as that

which has been made was therefore very desirable, and we feel sure that the addition of a representative of science to the committee will meet with general approval.

As the methods of selecting candidates for the Army have been altered repeatedly during the last twenty years, and as the present regulations, which we owe largely to the exertions of Sir Henry Roscoe, came into action no later than November 1898, it is clear that only an exceedingly small proportion of our present officers have been selected under those regulations and that only a few of these can as yet have reached positions higher than that of a lieutenant. It is certain, therefore, that any defects that may have been detected during the trials of the last two years must, so far as they are due to systems of selection at all, be the outcome, not of the present system, but of those narrower schemes which preceded it, and which, as we pointed out again and again before they were altered, tended to exclude certain classes of candidates from a profession which they were well fitted to adorn. This defect was remedied by the regulations now in force, and we trust that whatever changes may be found necessary there will be no reverting at this critical moment to the narrower policies of the earlier scheme.

There is said to be a strong and, we would venture to add, a highly reasonable feeling on the part of leading military authorities that what the Army wants is a plentiful supply of able candidates. If this be true, as we hope it is, we trust that the committee may find themselves able to make recommendations which will enable clever candidates who may not happen to be endowed with private incomes, or to be cadets of well-to-do families, to enter the Army more freely in the future than has been possible in the past. And, secondly, that they will take care that any new scheme of examination they may propose shall have no tendency to restrict the field of selection, but offer reasonably equal chances, as the present scheme does, to candidates of all suitable types and aptitudes. It would be a national misfortune if any present necessity of the Army should be made the basis of changes which would tend to reproduce the conditions of ten or a dozen years ago.

STUDIES ON THE STRUCTURE OF THE UNIVERSE.¹

A VERY interesting publication has recently been issued by Mr. Stratonoff, of the Russian Observatory at Tachkent, on the structure of the universe, a problem which has a fascination of its own for most readers quite apart from any real progress which may be made towards its solution.

The question is so vast that the researches of our greatest astronomers have done little more than lead us to the top of Pisgar and show us from afar the promised land, but every newly ascertained fact, or even confirmation of old ones, is a valuable contribution towards the general stock of knowledge which is being gradually accumulated, out of which, perhaps, the genius of some future Newton may evolve some general law.

Before any real advance can be made in the study of the structure of the universe, it is necessary to commence, and perhaps finish, with the Milky Way, that great band of faint stars which has puzzled mankind from the earliest times and which has been explained more according to the imagination of the observers than with any regard to the facts. Indeed, before the age of modern scientific instruments there were no facts to explain anything, and even now, with all our present resources, fresh facts are only being very slowly brought out ; we still depend very

¹ "Publications de l'Observatoire Astronomique et Physique de Tachkent. Etudes sur la Structure de l'Univers," par W. Stratonoff, Astrophysician de l'Observatoire de Tachkent.

largely on eye observations, only the eye we now use is the photographic camera.

We know in a general way that the galaxy is composed of very faint stars, presumably at an immense distance from our system, and that the stars have a tendency to thin out as we leave this region and approach the galactic poles. The great researches of Herschel, W. Struve, Argelander and Seeliger have thrown much light on the distribution of the larger stars as shown in the various catalogues ; there, however, still remained the telescopic stars to deal with, and it is this part of the question that Mr. Stratonoff has taken in hand.

Mr. Stratonoff has devoted himself to the making of a series of charts showing the distribution of the stars in the northern hemisphere and down to 20° south, and for this purpose he has divided the part of the sky dealt with into 1800 separate areas, and tables are given showing the density of the stars in each. These particulars are represented in the maps by a colour scale by which the regions containing the largest number of stars may be seen at a glance.

The first eight maps show the distribution of stars to each half magnitude from the 6th to 9·5 ; and the well-known tendency of the stars below the 6th magnitude to leave the poles and crowd more and more towards the galactic equator is well shown in the case of each magnitude.

The Milky Way itself Mr. Stratonoff considers to be an agglomeration of immense condensations, or stellar clouds, which are scattered round the region of the galactic equator. These clouds, or masses of stars, sometimes leave spaces between them and sometimes they overlap, and in this way he accounts for the great rifts, like the Coal Sack, which allow us to see through this great circle of light.

Mr. Stratonoff also finds evidence of other condensations of stars in these maps ; the nearest is one of which our sun is a member, chiefly composed of stars of the higher magnitudes, which thin out rapidly as the Milky Way is approached.

A second condensation is also found at a distance represented by the stars of magnitudes from 6·5 to 8·5, and a third, still further off, at about the distance occupied by stars of magnitudes from 7·6 to 8.

Mr. Stratonoff has also pushed his inquiries into the distribution of the stars according to their spectral type.

For the purposes of this inquiry the Draper Catalogue has provided the materials. In this catalogue the stars are divided into sixteen classes, known by letters from A to Q. In order, however, to facilitate mapping, Mr. Stratonoff has put all these classes into two :—Class I. embraces the divisions A, B, C and D, and Class II. takes in the rest. These two classes are too large to make these two maps of the distribution of the spectral types of much service, but they may be taken to give some rough idea of the position in the heavens of the stars of Secchi's types I. and II. From a glance at these maps it is seen that the stars of type I., which includes the Sirius and Orion stars, are situated principally near the Milky Way, while those of type II., which includes our sun, are principally condensed in a region coinciding roughly with the terrestrial pole, and only show a slight increase, as compared with other stars, as the galaxy is approached.

This mapping out of stars in their spectral classes is of the highest interest in the study of the structure of the universe, but we doubt whether the study of these types is sufficiently advanced to get any real information which can assist the student in this respect, and we must be content to wait until a far larger number of stars has been accurately observed before such maps can have anything more than a passing value. Mr. Stratonoff, however, has skilfully used the material he had, and we hope that he will take up this part of his subject later on.